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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

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DISEASES of the NERVOUS SYSTEM

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A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Types of Epilepsy and Their Treatment

I. CHARLES KAUFMAN, M.D.*
Boston, Massachusetts

Introduction

The concept of epilepsy presented here is derived from Hughlings Jackson[1] and owes a great debt to the researches of Penfield and Jasper.[2-5]

An epileptic attack begins with cellular discharge in a localized area of the brain which is true in all cases. From the site of origin the seizure discharge may spread to involve other areas of the brain. We can account for the variety of clinical epilepsy by a variety of site of origin and pattern of spread of the discharge.

In general there are two ways in which epileptic discharge may spread. The first of these is by direct tissue contiguity, more or less independent of neuronal pathways. (This may be a purely electrical phenomenon for it may cross even sectioned brain.[6]) Such spread occurs in a Jacksonian Seizure where the discharge travels along the grey feltwork of the cortex. The successively involved areas bear no direct functional relationship to those previously involved. The second type of spread is probably the more common and the more significant. This is by way of neuronal pathways, and as such there are several varieties, but in all instances there is a direct functional relationship between the sucessively involved areas. For example, a discharge may spread from a discrete area to the contralateral (corresponding) area via callosal fibers. Or there may be spread from frontal eye fields to occipital visual cortex. Any fiber system may be thus involved. Of greater interest in this type of spread is that from cortex to higher brain stem areas.

There are areas in the higher brain stem which serve as relay stations (sensory and motor) between cortex and periphery. There are also areas in this region which serve to coordinate and integrate activity in cortical and lower centers. In a sense these areas serve a higher purpose in the levels of functional integration[1] within the nervous system than the cortex itself. For example, disabling though they may be, extensive cortical ablations do not completely destroy the power of awareness and introspection, whereas disruption of the higher brain stem (diencephalon and perhaps mesencephalon) invariably leads to loss of consciousness (awareness). For this reason the higher brain stem has been called the "highest level" and is sometimes referred to as being *supracortical.* Not only might this area be susceptible as the origin of epileptic discharge, but by its intimate relationship to cortical areas on both sides, front and rear, might be very apt to become subsequently involved by spreading epileptic discharge originating anywhere in the cortex.

We may then proceed to a classification and clinical understanding of epileptic attacks. There is in some people a genetic tendency to the development of epilepsy. The nature of this constitutional defect is not

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known. It is not associated with visible pathology. It is manifested by an increased susceptibility of the "highest level" to epileptic discharge.

The rarity or absence of idiopathic epilepsy in lower forms of life suggests that the disease is a statistical inevitability of the increasing complexity of man, anatomically, physiologically, and psychologically. Norbert Wiener in his studies (cybernetics) has pointed out many interesting analogies between man and the (computation) machine. One of his concepts involves "jamming," which occurs in the machine when one point is fed too much information. He has noted that the process of encephalization in man has created just such critical points in the brain stem. It is conceivable that idiopathic epilepsy in man is the consequence of "jamming" in the "highest level," which is particularly vulnerable because of its enormously increased complexity of function without equal increase in size.

Such discharge arising in the "highest level" may be slight and locally contained, in which case the only clinical symptom would be paralysis of the leading function of this area, namely a loss of consciousness. This is petit mal. It is brief, seconds in duration, and is an uncomplicated loss of consciousness. If the discharge, though minimal, spreads slightly into the mid-brain, the postural mechanisms may also be inactivated, and the individual during the brief loss of consciousness might fall to the ground. This is the akinetic form of petit mal. Also, if the discharge, still minimal, spreads slightly to motor areas, there might be a single jerk or several jerks of an extremity, or of the face, associated with the brief loss of consciousness. This is the myoclonic form of petit mal. These 3 forms of petit mal we consider as idiopathic or "highest level" seizures of a minor type. The electrical characteristics of the "highest level" mechanism are such that discharge here is manifested by a 3/second rhythmic disturbance in the EEG, so characteristic of the petit mal attack as Gibbs, Davis and Lennox[7] pointed out years ago.

If the discharge originating in the "highest level" is of greater intensity and succeeds in actually spreading, this sweep of detonation involves most or all of the brain, and a generalized tonic-clonic convulsion ensues. In such cases the EEG taken before and then during the attack would reveal first the 3/second rhythmic disturbance and then a change into the high voltage rapid spikes so characteristic of a generalized convulsion (regardless of origin). This convulsion we can call a "highest level" seizure of a major type. Two things distinguish this type of major seizure from other generalized convulsions: 1) the onset by loss of consciousness; and 2) the initial electrographic 3/second abnormality. In idiopathic seizures there are no true auras or immediate warnings.

With respect to other types of epilepsy, there seems to be an inherent capacity of grey matter to develop disposition to seizure discharge following insult, as by trauma, or disease, or congenital abnormality. In such cases it is not often the "highest level" but some other discrete area which becomes the epileptogenic focus. These can best be called focal seizures. The epileptic discharge first manifests itself clinically by disruption of the normal function of that area, either as inhibition or enforced evocation. Thus seizure discharge in Broca's area produces arrest of speech (inhibition), whereas discharge just behind Broca's area will evoke a sound unwilled by the patient. The extent of the attack will depend on the degree of spread of the discharge. When the discharge remains localized, the attack is minor and consists only of the disturbed function of that area. When the discharge spreads extensively, the attack ends as a generalized convulsion with the focal sign as the aura. Once a generalized convulsion is under way its origin is no more discernible than is that of a traveler hurrying out of Grand Central Station. It is in the onset of the attack, therefore, that the clue to the focus is to be found. However, sometimes amnesia is a consequence of rapid, extensive seizure discharge spread, and the search for the focus may become more difficult.

Sometimes spread from the focus is by direct contiguity resulting in the famous Jacksonian March—a seizure discharge may start in the thumb area and spread through the motor cortex involving successively the different parts of the arm and then the leg. More often, however, the spread is by neu-

ronal circuits and most often to the integrating area in the higher brain stem, with then final spread back to all the accessible cortex on both sides. For example, a patient has attacks with the following sequence: he suddenly notices a tingling sensation in the right thumb; he then falls to the ground and has a generalized convulsion. We may infer that a seizure discharge originates in the left post-central gyrus (thumb area) at which time he notices the tingling. It then spreads to the "highest level" at which time he becomes unconscious. Finally it spreads back to the cortex of both sides and he has a convulsion.

To describe all the auras that occur would require dealing with all the functions of the grey matter of the cortex, the walls of the ventricles, the diencephalon, and the midbrain. (For an excellent review see Penfield and Jasper[4]).

Perhaps most interesting of the focal seizures are those arising in the temporal lobe, which usually have a psychical onset consisting of an illusion (of space, time, etc.) or an hallucination. Often these auras are related to the life experience of the patient (a remembered scene or an old dream) suggesting that the acquired neuronal patterns of the temporal lobe have much to do with memories, thoughts and feelings. This is not yet to say that the temporal lobes are the seat of engram formation, but they do play an important role.

Closely related to the psychical seizures are those attacks which are best termed automatisms. These are characterized by behavioral patterns which appear to be meaningful or purposeful and yet are often out of context, and the subject is inaccessible to ordinary influence. He may walk to and fro, apparently looking for something. Or he may just look off in the distance and appear dazed. There may be mumbling or words spoken, but he will not respond, and if interfered with may become combative or aggressive. Such automatisms probably result from involvement by the seizure discharge of the temporal lobe(s) and its fiber connections with the "highest level." They may not represent the origin of the attack since they are often fleetingly preceded by an aura, usually psychical or masticatory in nature, but they usually point to temporal lobe or nearby foci. Amnesia from the onset of automatic behavior is characteristic, but the fleeting aura may be recalled. Occasionally a petit mal attack in which the patient stops what he is doing and appears momentarily dazed may be confused with temporal automatism, but the duration is much briefer, there is no moving about, and the EEG is quite different. More difficult to distinguish may be the frontal automatisms due to involvement of the orbital or mesial surface of the frontal lobe. These are characterized by periods of confusion with forced or stereotyped behavior. These also apparently result from spread to the "highest level," which it must be remembered is not a point or even an isolated nucleus but is composed of different parts and functional complexes which experimentally can be differentially activated.[8] Frontal automatism can be differentiated by the absence of psychical aura, by a different EEG localization, and by the succeeding events which often include forced turning of the head and eyes to the opposite side.

The term "psychomotor" epilepsy has been applied to attacks with psychical phenomena, to attacks of stereotyped behavior, and to attacks of automatic behavior. This seems confusing to us since it applies to a variety of attacks with varying sites of origin. Furthermore, it would seem to be a misnomer since these attacks are, if anything, psychoparetic, with markedly decreased psychological potential, and with deficient processes of integrative awareness, of logical reasoning and response, and of orderly constructive thinking.

Any variety of epilepsy can be either minor or major in the same person at different times. The variable factor is the extent of spread of seizure discharge. By a major seizure we mean a generalized convulsion. This may be called "grand mal," a time-honored term, but what it describes is entirely nonspecific and without diagnostic significance. We therefore prefer to drop this term because of the diagnostic significance historically applied to it.

The differentiation between idiopathic and focal seizures (and among the varieties of focal seizures) is based primarily on the clinical picture of the attack. The EEG as a confirming device is most useful, but diag-

nosis by EEG alone is unwarranted and fallible. Also of frequent aid are the neurological examination, spinal fluid studies, and x-rays. It is to be remembered that at any given point in the study of a particular patient, we may not possess sufficient information to make a definitive diagnosis as to type of seizure. In such cases the tentative diagnostic category of cerebral seizures is useful. This serves only as a stimulus to further investigation and thought. Further study should reveal that these seizures are either focal or idiopathic, or due to such extra-cerebral causes as hypoglycemia, hyperpyrexia, or uremia. The study of focal seizures should include a careful search for the exact focus and its specific pathology. An outline of the diagnostic classification used is shown in Table 1.

TABLE 1

Classification of Seizures

1. Idiopathic ("highest level") seizures
   Minor or major
2. Focal seizures
   Clinical pattern—minor or major
   Locus
   Pathology and Cause
3. Cerebral seizures (preliminary diagnosis)
4. Extra-cerebral seizures
   Cause

Present Study

One hundred and two consecutive admissions to a seizure clinic* and 15 private patients were selected for this study, the sole criterion being the occurrence of seizures. The diagnoses are shown in Table 2. It may be seen that 17 have *idiopathic epilepsy,* 69 have *focal seizures, and* 30 could be diagnosed only as having *cerebral seizures;* 1 child had had seizures due to high fever and is excluded from all subsequent remarks.

The 116 epileptic patients include 60 males and 56 females. The ages upon admission varied from 8 to 73 years, although a majority of the patients were in the 3rd and 4th decades of life. Seizures had been occurring for periods from 3 months to 60 years, with a majority of the patients having had seizures for 10 or more years (Chart 1). Furthermore, 93 (80.1 per cent) had been previously treated with anticonvulsive medication. In other words, this was an "old" epileptic population who for the most part were still seeking further gain from treatment.

TABLE 2

Classification of 117 patients with Seizures

1. Idiopathic Seizures			17 (14.5%)
Minor only	6		
Major only	3		
Minor and major	8		
2. Focal Seizures			69 (58.9%)
a. Sensory		29	
Major only	14		
Minor and major	15		
b. Motor		7	
Minor only	1		
Major only	5		
Minor and major	1		
c. Psychical		13	
Minor only	2		
Major only	4		
Minor and major	7		
d. Autonomic		1	
Minor and major	1		
e. Ictal Automatism		19	
Minor only	7		
Minor and major	12		
3. Cerebral Seizures			30 (25.7%)
4. Extra-cerebral Seizures			1 (0.9%)
Hyperpyrexia	1		
TOTAL			117 (100%)

TABLE 3

Results of Anti-Convulsive Drug Therapy in 81 Epileptic Patients

Free of attacks	37
75 per cent improved	31
50 per cent improved	6
25 per cent improved	3
Unimproved	4
TOTAL	81

The main purpose of this study is to evaluate the overall effects of drug treatment of these patients, to compare the various drugs used, and to take note of any toxicity encountered. This phase of the presentation is based upon our experience with 81 of the 116 patients for periods up to 23 months. The other 35 cases either were not treated with anti-convulsive drugs, or were treated for periods too short to permit evaluation.

Of the 81 patients who received a fair trial of anti-convulsant drug therapy, 37 (45.7 per cent) are free of attacks, and 31 (38.3 per cent) show a reduction in incidence of attacks of at least 75 per cent, whereas only 4 (4.9 per cent) are still unimproved (Table 3). These results are based on the use of a

*Seizure Clinic, Massachusetts Memorial Hospital, Boston, Massachusetts.

variety of drugs in varying doses, sometimes in combination. In order to evaluate the effectiveness of each single drug, we have tried wherever possible to use that drug alone. However, considerations of patient welfare frequently necessitated the use of supplementary medication, which practice unfortunately complicates this analysis. We shall try to evaluate each drug used, in the treatment (1) of epilepsy generally, and (2) of the various sub-types of epilepsy.

1. *Mesantoin (3-methyl 5,5 phenylethyl-hydantoin).*

This hydantoin was used (in fair trial) in 42 cases of epilepsy, in doses between 0.1 - 1.3 gram/day for periods ranging from 1.5 to 19 months. It was used alone in 26 cases: eleven are free of attacks, eleven show a reduction in incidence of attacks of at least 75 per cent, and one a reduction of at least 25 per cent; one was unimproved and two developed toxicity that necessitated stopping the drug. It was used together with other drugs in 16 cases: three are free of attacks, five show a reduction of attacks of at least 75 per cent, one a reduction of at least 50 per cent, and one a reduction of at least 25 per cent; two were unimproved, and four had to be taken off medication because of toxicity. Thus 33.3 per cent of the patients receiving Mesantoin are free of attacks and 40.5 per cent are markedly improved.

Many of the patients complained of being drowsy or "dopey," but this usually receded as time wore on or as the dose was cut. In three cases, however, the medication had to be eliminated because of excessive drowsiness; two patients developed vertigo, but only one had to be taken off Mesantoin; two patients developed generalized erythematous rashes and the medication had to be discontinued. Thus there were six patients who could not tolerate Mesantoin. All cleared up when the drug was stopped. No blood dyscrasias have been encountered. (All the patients here reported, regardless of which medication they have taken, have had frequent blood counts. No abnormal response of any consequence has been found.)

2. *Dilantin Sodium (5,5 diphenyl-hydantoin sodium).*

This well known hydantoin was used in 39 epileptic patients, in doses from 0.2 to 0.6 gram/day for periods of 1 to 19 months. It was used alone in 22 cases: thirteen are free of attacks, three have shown a reduction of attacks of at least 75 per cent, one a reduction of at least 50 per cent, and one a reduction of at least 25 per cent; three were unimproved and one became toxic. It was used together with other drugs in 17 cases: three are free of attacks, seven are 75 per cent better, one is 50 per cent better, and two are 25 per cent better; three were unimproved and one toxic. Thus, among the patients receiving Dilantin 41 per cent are free of attacks, and 30.7 per cent are markedly improved.

Gingival hyperplasia was noted in a number of patients but was of consequence in none; one patient had to discontinue Dilantin because of vertigo and one because of excessive drowsiness.

3. *Diphenyl hydantoin (5,5 diphenyl-hydantoin).*

This acid salt of diphenyl hydantoin has been used in 13 cases in doses from 0.3 to 0.9 gram/day for periods of 1 to 16 months. It was used alone in eight cases: two are free of attacks, two are 75 per cent better, one is 50 per cent better, and one is 25 per cent better; two became toxic. It was used together with other drugs in 5 cases: two are free of attacks and one is 75 per cent better; one was unimproved and one became toxic.

CHART 1

Duration of Illness and Previous Drug Treatment

	DURATION OF SEIZURES (in years)							TOTAL
	Under 1	1-2	3-4	5-10	11-20	21-50	Over 50	
Total No. of Cases	2	8	14	37	30	23	2	116 (100%)
No. of cases treated previously with anti-convulsant drugs	0	4	7	27	30	23	2	93 (80.1%)

Thus, among the patients taking this drug 30.3 per cent are free of attacks and 30.3 per cent are markedly improved. The toxicity encountered was a morbilliform rash in one case, vertigo and nystagmus in another, and vertigo in a third (taking also other drugs).

4. *Tridione (3,5,5 trimethyl oxazolidine-2, 4-dione).*

We have used this drug in but 5 cases, in doses from 0.9 to 1.2 gram/day for periods of 1 to 10 months. It was used alone in four cases: two are free of attacks but two others became toxic. When used with other drugs in one case, the patient was 75 per cent better. The toxicity encountered was generalized pruritic erythema in one case and excessive drowsiness in another. No blood dyscrasia was noted.

5. *Paradione (3,5 dimethyl, 5 ethyloxazolidine-2,4-dione).*

This homolog of Tridione we have used in 16 cases in doses from 0.9 to 1.8 gram/day for periods from 1 to 19 months. It was used alone in 12 cases: six are free of attacks, and three have shown a reduction of attacks of at least 75 per cent; three were unimproved. It has been used with other drugs in 4 cases: one is free of attacks, and one is 75 per cent better; one was unimproved and one became toxic. Thus, of the patients receiving Paradione 43.8 per cent are free of attacks and 25 per cent are markedly improved. The only toxicity encountered was a papular erythematous rash on head and trunk in one patient (also taking other drugs).

6. *MB 236 (3 phenyl, 3 ethyl, 2-piperidone).*

This drug has been used in only nine cases in doses from 0.2 to 2.0 gram/day for periods of 0.5 to 10 months. In six cases it was used alone: one is free of attacks, one is 75 per cent better, and two are 50 per cent better; two others became toxic. It was used with other drugs in three cases: two are 75 per cent and one is 50 per cent better. The two toxic patients each developed a generalized maculo-papular rash.

7. *Phenurone (phenacetylurea).*

This anti-convulsive drug (the first straight chain chemical so used) we have tried in only seven cases in doses from 1.5 to 2.5 gram/day for periods of 1.5 to 10 months. It has been used alone in five cases: three are 75 per cent better but two became toxic. In two cases it was used with other drugs: both are 75 per cent better (but one of these patients was depressed and agitated until the dose of Phenurone was reduced from 2.5 to 1.5 gram/day). The two cases in whom toxicity necessitated stopping the drug showed anxiety in one and vertigo in the other.

In the past few years there has been an effort to find specific drugs for the different types of epilepsy. Tridione seems to be such a specific for petit mal which is rather unaffected by the hydantoins. Perlstein and Andelmann[9] reported that Tridione was useful in all types of epilepsy, but Lennox and his co-workers[10,11] found that whereas it was extremely effective in petit mal, it was helpful in only 21 per cent of cases with "grand mal," and made others worse. It occurred to us that since Tridione is so effective in "highest level" seizures of a minor type, it (and its homolog, Paradione) might also be effective in "highest level" seizures of a major type.

We have used Tridione in three cases of "highest level" seizures, two with minor attacks (petit mal) only who are now free of attacks, and one with both major and minor attacks who is now markedly improved.

Paradione has been used in eleven cases of idiopathic epilepsy. Five of these had minor attacks only; three are free of attacks and two are 75 per cent better. Three had both minor and major seizures; two are free of attacks and one is 75 per cent improved. Three had *only* major seizures; two are free of attacks and one is 75 per cent better. Thus, of the six patients with "highest level" major seizures, who were treated with Paradione; four are seizure free and two are markedly improved. (The EEG in all these cases has undergone a most remarkable change, having become either normal or near normal[12].) It should be mentioned that two of the six received also small doses of Dilantin, but they had taken larger amounts of Dilantin previous to Paradione therapy without much success.

As can be seen from Chart 2, neither Tridione nor Paradione has been particularly successful in other types of epilepsy. This chart also shows that the hydantoins have

not been nearly so effective as the oxazolidine-diones in idiopathic cases.

In the cases with focal seizures and cerebral seizures (which presumably will turn out to be focal after further study), however, the hydantoins are most successful. In this series there is little to choose between Dilantin and Mesantoin. A factor difficult to evaluate, that might change the balance between these drugs is that in many cases we started Mesantoin therapy because the patients told us they had taken Dilantin without great success. In 35 cases treated with Dilantin, 28 (80 per cent) are either free of attacks or much better, and in 39 treated with Mesantoin, 31 (79.5 per cent) are either seizure free or much improved. The acid Diphenyl Hydantoin was used in 13 such cases of whom nine (69.2 per cent) are either free of attacks or markedly improved.

The major unwanted side action of Mesantoin is drowsiness but this can usually be overcome by patience. Of minor annoyance is the necessity for periodic blood counts, but this actually serves as a good opportunity to keep the patient under surveillance. An advantage of Mesantoin is the larger dose that may be used without serious toxicity. Quite often the greatest benefit can be derived from the combined use of Dilantin and Mesantoin.

The acid Diphenyl Hydantoin has shown no advantages in this series over the alkaline Dilantin.

Among the group of focal seizures are the so-called "psychomotor" attacks. It has been reported that these are more responsive to Phenurone than to any other drug.[13] We have used Phenurone in seven cases that we presume correspond (ictal automatism and psychical seizures). Of these, five (71.4 per cent) are much improved. In fifteen such

CHART 2

Comparison of Drugs Used in Epilepsy

				—	— FOCAL —			—		TOTAL
		"Highest Level"	Cerebral	Sensory	Motor	Auto-nomic	Auto-matism	Psy-chical	Total	
Mesantoin	Free	0	3	3	2	1	2	3	11	14
	Improved*	2	3	6	2		4	2	14	19
	Unimproved	1	0				1	1	2	3
	Toxic**	0	0	3	1		2		6	6
Dilantin Sodium	Free	1	5	7	1		2		10	16
	Improved	2	3	3	2		3	2	10	15
	Unimproved	1	3	1			1		2	6
	Toxic	0	1	1					1	2
Diphenyl Hydantoin	Free	0	1	2			1		3	4
	Improved	0	0	4				1	5	5
	Unimproved	0	0					1	1	1
	Toxic	0	0				2	1	3	3
Paradione	Free	7	0						0	7
	Improved	4	0						0	4
	Unimproved	0	1			1	1	1	3	4
	Toxic	0	0				1		1	1
Tridione	Free	2	0						0	2
	Improved	1	0						0	1
	Unimproved	0	0						0	0
	Toxic	0	1					1	1	2
Phenurone	Free	0	0						0	0
	Improved	0	0				3	2	5	5
	Unimproved	0	0						0	0
	Toxic	0	0				2		2	2
MB 236	Free	0	1						0	1
	Improved	0	1	2	2		1		5	6
	Unimproved	0	0						0	0
	Toxic	0	0				2		2	2

*Refers to any degree of improvement (in great majority represents at least 75 per cent).

**Refers to a degree of toxicity necessitating stoppage of medicine.

In this Chart no distinction is made between the use of a drug alone or in combination with others. There is, therefore, a certain amount of overlapping.

cases we tried Mesantoin: eleven (73.4 per cent) are either free of attacks or much improved. In eight cases we used Dilantin: seven (87.5 per cent) are either seizure free or much improved (Chart 2). In this series, thus, we find no advantage for Phenurone, but it seems warranted to continue its trial.

Summary and Conclusions

Brain cell discharge is the basis of all epileptic seizures. To understand and treat the various types of epilepsy, then, becomes a matter of determining the site of the original discharge and its manner of spread. One-hundred-sixteen epileptic patients are diagnosed in these terms, and the results of drug treatment of the 81 who received adequate treatment are described.

"Highest level" (idiopathic) *seizures*, whether minor or major, are best treated with the oxazolidine-diones (Paradione and Tridione), whereas *focal* (acquired or symptomatic) *seizures* are best treated by the hydantoins (Dilantin, Mesantoin). Also of value are the experimental drugs, Phenurone, MB 236, and the acid Diphenyl Hydantoin. In many cases a combination of drugs is the best treatment.

Author's Note: The drugs used in this study are manufactured by, and were supplied by the following:

1. Mesantoin by Sandoz Pharmaceuticals, Inc., New York, New York.
2. Dilantin Sodium by Parke, Davis and Company, Detroit, Michigan.
3. Diphenyl hydantoin by Winthrop-Stearns, Inc., New York, New York.
4. Tridione by Abbott Laboratories, No. Chicago, Illinois.
5. Paradione by Abbott Laboratories, No. Chicago, Illinois.
6. MB 236 by Maltbie Chemical Company, Newark, New Jersey.
7. Phenurone by Abbott Laboratories, N. Chicago, Illinois.

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FORUM ON EPILEPSY ANNOUNCED

The First Western Institute on Epilepsy will meet in Denver at the University of Colorado Medical Center, May 16, 17 and 18. Members of the medical profession, as well as social workers, psychologists and interested laymen are invited to attend. Lectures, clinics, and round table discussions on Epilepsy will be held. Dr. Jerry Price of the Neurological Institute, New York City, will be the keynote speaker. Institute fees will be $5.00. Write for information to: Dierctor, Epilepsy Service, University of Colorado Medical Center, Denver, Colorado.

Practical Features of Pathologic Diagnosis of Neuroglial Tumors of the Central Nervous System*

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When the physician, surgeon, radiologist, or pathologist is confronted with some aspect of the problem of diagnosis and treatment of a neuroglial tumor of the central nervous system, he will want to know (1) age and general condition of the patient, (2) gross structural relations of the tumor: its situation, with particular regard for encroachment on vital centers, its size and general extent, degree of demarcation, and surgical removability with preservation of adequate function of the nervous tissue, (3) rapidity of growth of the tumor and tendency to spread through surrounding normal parenchyma and subarachnoid space.

The foregoing information may be difficult or impossible to secure completely, but insofar as it is available, it will help decide whether operation or irradiation, or both, or neither, should be carried out and what length of survival and of retention of adequate neurologic function may be expected. Physician, surgeon, and radiologist share the burden of endeavoring to provide information regarding the general condition of the patient and the gross relations of the neoplasm. The pathologist, by means of microscopic study, endeavors to evaluate the probable rate of growth and the tendency of the tumor to spread through normal nervous parenchyma and subarachnoid space. Such evaluation may be carried out under either of the following circumstances: (1) an immediate impression is rendered, following study of frozen sections or of other rapid preparations, such as supravital films; the histologic impression may be used by the surgeon in determining surgical procedure, (2) a more leisurely opinion is given, after the operation has been concluded, on the basis of permanent sections, some of which may have been prepared specially. Such information is of little value in guiding surgical procedure, except in case of re-exploration; it is of confirmatory importance, provides a permanent record, and may be used in considering radiologic treatment and in forming prognosis.

With rise of neoplastic pathology, a practical advantage of the histologic study of tumors became apparent in that neoplastic tissue of a given type would be likely to behave like similar tissue encountered previously. This was true not only of different tissue types, as lymphocytic, fibroblastic, epithelial, and so forth, but also of stages or degrees of differentiation within the tissue types individually. Hansemann,[1] epitomizing the experience of pathologists of his time, postulated a broad correlation between degree of anaplasia in a tumor and degree of malignancy of the tumor: i.e., vigor of growth, infiltration, and metastasis. Anaplasia was represented histologically by variation in size and shape of cells and of their nuclei, by cellular hypertrophy, nuclear hypertrophy and hyperchromaticity, and over-all failure of the tissue to reproduce the mature pattern. Broders[2] provided, by quantitative study, definite evidence of the correlation between degree of dedifferentiation and percentage of survival, using carcinoma of the lip for material. Dedifferentiation was regarded as a regression of cells from the normal level of differentiation. Four grades of malignancy were established, grade one representing tissue in which from 0 to 25 per cent of cells were differentiated; grade two, 25 to 50 per cent; grade three, 50 to 75 per cent; grade four, 75 to 100 per cent. (In routine practice, cells are not counted, but a general impression of the degree of differentiation is rendered.) Later on, the principles of grading were applied to other tissues, including adenocarcinoma, fibrosarcoma, and leiomyosarcoma.

Bailey and Cushing[3] undertook histologic classification of a large number of tumors of the nervous system in the attempt to dis-

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cover some explanation of the variation which they had observed in length of survival. As a result of their study, they succeeded in clarifying the over-all classification of gliomas, in establishing some new categories, and in demonstrating correlation between histologic type and length of survival; for example, fibrous astrocytoma, a well-differentiated histologic type, was attended by relatively long survival and amenability to surgical treatment. Of importance was the occurrence of a certain proportion of tumors not easily classified in established categories, and the need, apparent later, for reclassifying some of the tumors.

In this way, the simple diagnosis of gliomas developed into one of several types of glioma. The therapeutic and prognostic advantage of diagnosis of a category of glioma was balanced against difficulty of secure diagnosis and against confusion of nomenclature, considering the activity of various additional contributors. The appearance of a large number of mixed gliomas, that is, consisting of members of more than one of the various cell groups, together with the occurrence of tumors resisting clear classification even in the most experienced hands, added to the difficulties. Under such conditions, the value of categorical diagnosis might not always be expected to be of standard value approaching that in cases of carcinoma, lymphosarcoma, and so forth. Even in case of reasonably regular agreement on histologic diagnosis as to cell group, the most important factor might not be clearly provided: estimation of degree of malignancy of the tumor.

In view of the foregoing difficulties, a procedure somewhat as follows, for use in study of tumors of the central nervous system, was adopted some years ago at Western State Hospital and continued more recently at Indianapolis General Hospital, with convenience and with apparent and empirical satisfaction: (1) an effort is made to establish, if possible, whether the tumor is one of (a) neural parenchyma: i.e., nerve cells and/or glia, (b) mesenchymal tissue: i.e., sarcoma of meninges; this sometimes requires preparation to show reticulum, in the diffuse, undifferentiated forms (this would not be possible in frozen sections of fresh tissue), (c) metastasis. (2) If the tumor can be identified with reasonable certainty as being of neuroglial origin (sarcomas also are amenable to grading, but that is not within the scope of the discussion), the general degree of differentiation may be estimated. Usually, a grade is assigned according to Broders' classification; sometimes, a grade not being sharply evident, the tumor may be described as being of good, medium, or poor differentiation. (3) The cell group or groups represented most prominently are itemized. Some times, the latter is not practical; so many cell types are encountered that one ends with a list of the whole glial family tree. In some cases, the cells are not easily classified.

Recently, Kernohan and his associates[1] made a quantitative study of astrocytoma and ependymoma like that originally carried out by Broders[2] on carcinoma, and demonstrated a correlation between grade of malignancy, on a basis of one to four, on one hand, and on the other, average preoperative duration of symptoms, average length of postoperative survival, and percentage of three-year survival. In view of the earlier stastical correlation found by Bailey and Cushing,[3] the same correlation would be expected on re-categorizing the standard types of glioma according to grade of malignancy on a numerical basis. From the data provided by Kernohan and associates,[4] it is evident, further, that the percentage of survival, duration of symptoms, and length of postoperative survival are roughly the same, grade for grade, in the two histologic tumor groups studied, indicating that *it is not the cell group* (i.e., astrocytic, ependymal, oligodendrocytic, neurocytic), *so much as the degree of differentiation* that is of importance.

If the examiner finds difficulty in establishing the cell group of a glioma, he may still feel able to estimate the general degree of differentiation or malignancy, as mild, medium, or marked, and may justly then consider that he has fulfilled the practical part of his function. The frequent occurrence of mixed and of unclassifiable forms of glioma, together with the tendency of standard forms to contain multiple cell types, may, as mentioned previously, on occasion make it difficult or impossible to employ the main categories, or illogical to use them, since one would be naming a tumor after but one of its multiple cell constituents. For

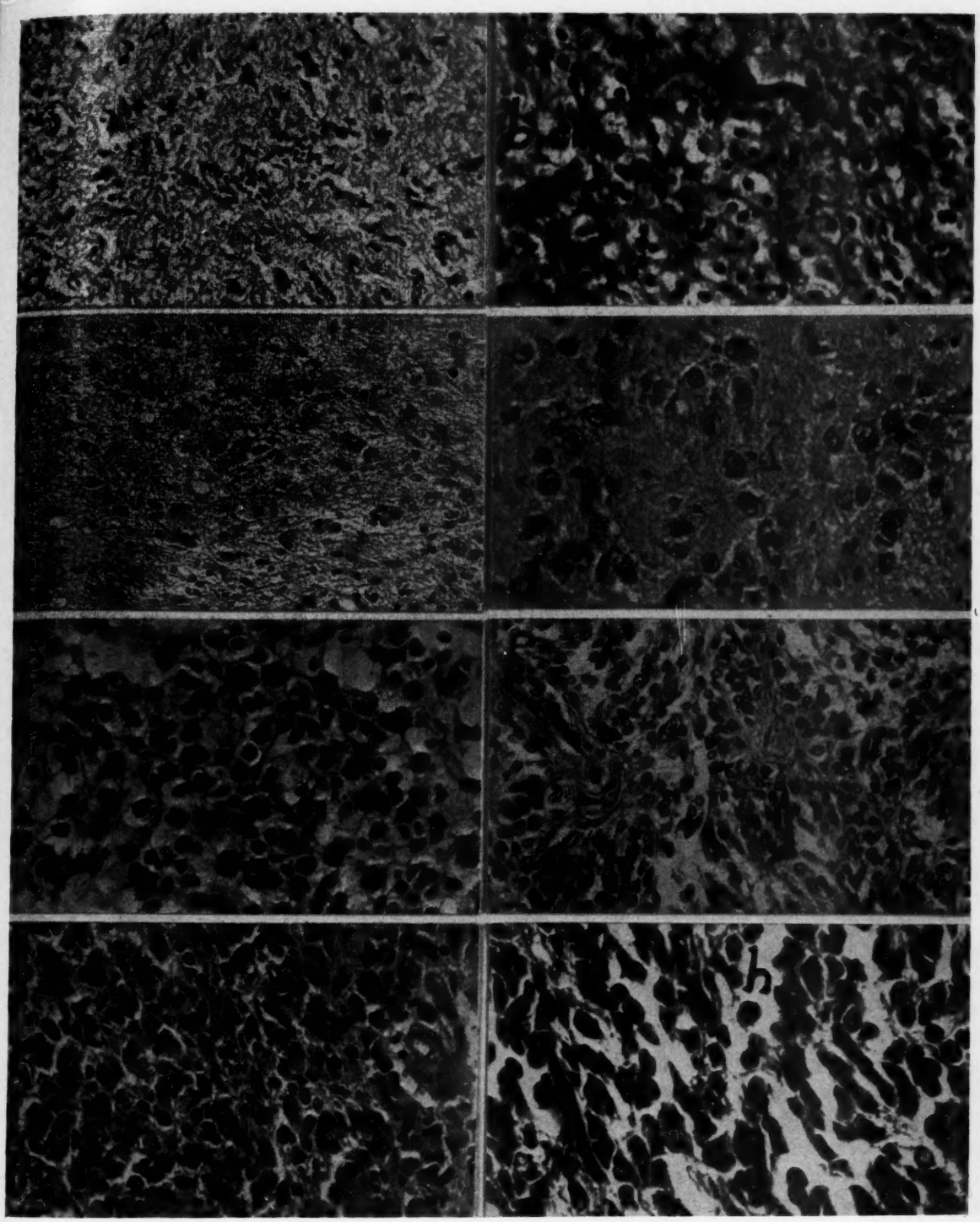

FIGURE 1: Some examples of neuroglial tumors, on a basis of estimation of degree of dedifferentiation.

a. Glioma, grade I, astrocytic (astrocytoma).

b. Glioma, grade I, oligodendrocytic (oligodendroglioma).

c. Glioma, grade II, astrocytic (astrocytoma).

d. Neurocytoma, grade II (ganglioneuroma).

e. Glioma, grade III, oligodendrocytic (oligodendroblastoma).

f. Glioma, grade III, astrocytic (astroblastoma).

g. Glioma, grade IV (glioblastoma multiforme).

h. Neuroglioma, grade IV (undifferentiated glioma, containing immature glial (elongated) and nerve (rounded) cells. Traditional classification would ordinarily lie between medulloblastoma and glioblastoma multiforme but nearer the former than the latter.

example, ependymomas may contain large numbers of astrocytes of varying type and stage of differentiation; this is true, for example, of the familiar epithelial type, presenting ependymal spaces interspersed with accompanying cells derived from the subependymal astrocytic "plate," with their elongated processes forming a meshwork about, and often attaching to, blood vessels. Ependymomas have been found by Kernohan and Fletcher-Kernohan[5] to contain oligodendrocytes, to an extent suggesting to them derivation of oligodendrocytes from ependyma. As for the type of "ependymoma" presenting loose perivascular radiation of cells referred to generally as "ependymoblastoma," this is indistinguishable from astroblastoma; the constituent cells of such a tumor may have arisen from glioblasts having some original relation to the ependymal surface of the primitive medulary lumen or of the matured ventricles, but there is nothing in the neoplasm to indicate such a relation. Glioneuroblastoma is another example of cell mixture; in view of variation in proportion of nerve and glial cells, one would not know whether to classify the tumor as astrocytoma or neurocytoma. Fusion of the neuroglial family group is shown further by the production, by medulloblasts, of the early members of the astrocytic, oligodendrocytic, and neurocytic series, in both tumors and normal embryogenesis.

Medulloblastoma does tend to appear in characteristic clinical-pathologic form (cerebellar tumor of childhood with wide subarachnoid dissemination), but this is not always the case; tumors of identical or closely similar histologic structure may appear in cerebral hemispheres of adults. If a low-grade astrocytoma is found histologically, and if exploration is being made in the posterior fossa of a child, cystic degeneration of the tumor may be expected. Ependymomas tend to occur within ventricles. For reasons such as the foregoing, the categorization of cell group is not abandoned outright, but is carried out for what it may be worth, whenever such classification appears reasonably clear, but this is done as a secondary measure. With a certain few possible exceptions, including those just referred to (i.e., cerebellar astrocytoma, medulloblastoma), the various cell groups, *grade for grade,* may be interchangeable regarding gross features of their corresponding tumors.

In consideration of the foregoing, a classification which will answer the need of the pathologist in the practical care of the patient will include: (1) glioma, grades I to IV, or of low, medium, or high malignancy, appending the main cell type or types, where practicable, as astrocytic, ependymal, or oligodendrocytic [or combined (as ependymal and astrocytic) or mixed form], (2) neurocytoma, grades I to IV, (3) neuroglioma, grades I to IV. Medulloblastoma is regarded as glioma, neurocytoma, or neuroglioma, grade IV (in each case, medulloblastoma type), depending on the elaboration of glioblasts, neuroblasts, or both. Medulloepithelioma is too rare to cause serious difficulty, but it may be regarded as neuroglioma, grade IV, medulloepithelioma type, since it reproduces the medullary tube, with its primitive, neuroglial bipotentiality.

Comparison may be made between glioma and squamous-cell carcinoma. It is possible to divide the latter into various categories, such as spinous, papillary, plexiform, and so forth, but these types are only a means of exercise, and do the patient no good, unless they are used to indicate degree of malignancy. A diagnosis of grade one to four squamous-cell carcinoma leaves little of practical value to add in the histologic interpretation.

The same pitfalls which are true of the grading of carcinoma are true of the grading of gliomas. One may anticipate some degree of variation in opinion, among different examiners, regarding grade of malignancy in a given case, or the same examiner may on occasion render an impression of grade varying slightly from that which he submits on another occasion, on the same material. Tissue in case of recurrence may exhibit increased activity. There may be variation in behavior among tumors of the same grade of malignancy and cell group: a tumor of comparatively well - differentiated histologic appearance may grow and infiltrate with unexpected rapidity, and the reverse may occur in the presence of an undifferentiated tumor. In practical application of grade, the histologic impression may lose significance in the presence of grave situation of the tumor and surgical inaccessibility. The gen-

eral condition of the patient may be such as to make operation inadvisable, or to lead to postoperative fatality or to unduly early demise from a tumor not treated in any active manner. Individually excessive edema may result in an unexpectedly prompt mortality. In spite of these shortcomings, *estimation of the grade of malignancy offers a certain advantage in the nature of a probability, or chance, that the tissue will behave in the expected manner, and that probability or chance of behavior of tissue can be used as one of the several factors in determining course of treatment and/or in formulating prognosis.*

Summary

Correlation exists between histologic grade of malignancy of a neuroglial tumor of the central nervous system and its gross pathologic and clinical degree of malignancy (Bailey and Cushing;[3] Kernohan and associates[4]). With full awareness of certain limitations of the applicability of grading of malignancy, one can, nevertheless, use such grade as one of several factors in determining treatment and in formulating prognosis in the individual case. In view of the tendency of the aforementioned neuroglial tumors to exhibit multiple cell groups or cells not easily classified, and in view of the wide range of variation in malignancy of tumors given the same diagnosis, as for example, astrocytoma and ependymoma, it appears preferable to return an estimation of grade of malignancy, on a basis of one to four or of low, medium, or high, with, secondarily, designation of the cell group or groups represented prominently, where the latter feature is sufficiently clear.

Note: The author of the foregoing article is at present Chief, Laboratory Service, Veterans Administration Hospital, Fort Logan, Colorado.

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*The Juvenile Patient in the State Hospital**

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Several years ago there appeared in the psychiatric literature a paper entitled "What Happens To Patients Who Are Hospitalized For The First Time When Over Sixty-five Years of Age."[1] This study was mainly directed toward hospital administrators and physicians preparing them for the problem at hand since there has been an increased admission rate of these patients to state hospitals. It was found in this study that from the administrators, and from an economic point of view, that despite the poor psychiatric prognosis the problem presented by these patients is to a considerable extent limited by a correspondingly poor physical prognosis with short survival time in the state hospital. The expectation of a very high death rate during the first few months following admission was pointed out. In other words, these patients do not present any burden of magnitude individually to the state hospital, but rather collectively on the basis of numbers in institutions generally all too overcrowded.

This present study is concerned with patients who are hospitalized for the first time in a state institution when under 18 years of age—the fate of the juvenile in the state hospital. That this problem is entirely different as compared to that of the aforementioned study is obvious at the outset since the high life expectancy of these patients, coupled with relatively poor psychiatric prognosis, has long been recognized as the source

*From the Eastern State Hospital.

of a considerable proportion of the chronic population resident in any state hospital. The impact on the hospital, the community and the state, as well as the tragedy to the individual and to his family has been many times mentioned. It is attempted in this study to show that mental illness when occurring in individuals under 18 years of age is probably more malignant in character and with poorer prognosis for ultimate full recovery or eventual readjustment in society, and to suggest too that society is morally derelict as well as economically foolhardy in not providing more adequately for the special therapy of the mentally sick adolescent.

In general, the occurrence of psychoses of any sort during childhood is infrequent. Although classical dementia praecox is thought of as a disorder taking its origin during puberty and adolescence, individual cases of this disease developing during the pre-pubertal period of childhood are still reported as clinical curiosities. In recent years with the growth of genetic-dynamic concepts in psychiatry, and especially with the emphasis on mental hygiene in child guidance clinics, increasing interest has been manifest in the study of psychoses during early childhood. There have been statistical reports concerned with the incidence of psychoses in childhood coming mainly from child guidance centers and institutions dealing with juvenile patients. A few reports, however, have come from hospitals principally for adults. In a study at the Cincinnati Child Guidance Home,[2] an incidence of 2 per cent of psychoses among an unselected group of 1,000 children was reported; in contrast to this, the Harriet Lane Home at Johns Hopkins Hospital in Baltimore reported an incidence of only approximately 0.25 per cent of psychoses among children;[3] while at the Bradley Home in Providence, Rhode Island, it was found that approximately 1.5 per cent of all children examined were suffering from major psychoses, mostly schizophrenia.[4] As far as the statistics from mental hospitals for adults are concerned, Strecker in Philadelphia[5] found only 18 cases of psychosis in individuals under 15 years of age out of a total of 5,000 admissions. Kasanin and Kaufman found 21 schizophrenics under 16 years of age out of 6,000 consecutive admissions to the Boston Psychopathic Hospital.[6] There are various other reports in this respect tending to confirm the accepted impression that frank major psychoses in individuals under 16 years of age are very rarely encountered in mental hospitals for adults or in state institutions for the mentally ill generally.

Almost all workers in this field agree that when a functional psychosis occurs in a juvenile, it is potentially chronic in nature, tending to run a malignant and sometimes catastrophic course.

Material and Methods

Since the opening in 1891 of the Eastern State Hospital at Medical Lake, one of three state institutions for the mentally ill in the State of Washington, 14,116 patients have been admitted. Among these there have been 273 patients hospitalized for the first time when under 18 years of age. Their hospital records as well as the follow-up reports were carefully checked and were organized according to diagnoses, treatment, adjustments during hospitalization and readjustment in society after release. When needed, additional information was obtained through personal interviews as well as by means of questionnaires in which specific data was sought, especially in regard to the patient's adjustment after hospital release. At this point it should be mentioned that at Eastern State Hospital there have been no special facilities, separate wards or departments assigned for the use and treatment of these juvenile patients, and presently with the hospital so seriously overcrowded by the aged and infirm, such special allocation of living space is precluded. Thus, regardless of age or diagnosis, all patients coming into this institution have received essentially similar admission examinations, treatments and other routine measures. In other words, a patient who, for instance, was 12 years of age at the time of admission to the hospital was placed on a ward with patients 35, 50, 75 and even 90 years of age. This juvenile has eaten in the same dining room, participated in the same daily routine and been constantly subjected to the beneficial or detrimental influences of fellow patients, for the most part the adult mentally deranged. There have been no special provisions for continuation of schooling or manual training other than in the occupational therapy department, the music

therapy department or bookbindery, to which patients are assigned to a considerable extent without attempt to classify and segregate on the basis of age group.

Results

The 273 juvenile patients under 18 years of age when admitted for the first time represent an incidence of 1.9 per cent of the total admissions; 177 (65 per cent) were males and 96 (35 per cent) were females. Classified according to the diagnosis, these 273 juveniles fall into the following groups:

94 (34 per cent) showed evidence of a Schizophrenic reaction type.
54 (20 per cent) were diagnosed as suffering from Manic Depressive Psychosis.
38 (13.5 per cent) were classified as suffering from Psychosis with Mental Deficiency.
29 (10.5 per cent) were suffering from Psychosis with Psychopathic Personality.
25 (9 per cent) were diagnosed as suffering from Psychosis due to Convulsive Disorder.
13 (5 per cent) were diagnosed as suffering from Psychosis with Syphilis of the Central Nervous System.
5 (2 per cent) were classified as suffering from Psychosis with Infectious Diseases.
2 (0.8 per cent) were diagnosed as suffering from Psychosis with Organic Brain Disease.
6 (2.4 per cent) were diagnosed as suffering from various other Psychoses.
2 (0.8 per cent) were undiagnosed.
5 (2 per cent) were regarded as Not Psychotic.

In this respect it was interesting to note the incidence of the various psychoses among the total admissions to the hospital.

28 per cent of all admissions to this institution were diagnosed as Schizophrenic reaction types as compared to 34 per cent in the juvenile group.
23 per cent of all admissions suffered from affective psychosis as compared to 20 per cent in the juvenile group.
2.4 per cent of all admissions were diagnosed as Psychosis with Mental Deficiency as compared to 13.5 per cent in the juvenile group.
2 per cent of the total admissions were diagnosed as suffering from Psychosis with Psychopathic Personality as compared to 10.5 per cent in the juvenile group.
3.4 per cent of all admissions were diagnosed as suffering from Psychosis due to convulsive Disorder as compared to 9 per cent in the juvenile group.
4 per cent of the total admissions to this institution were diagnosed as Psychosis with Syphilis of the Central Nervous System as compared to 5 per cent in the juvenile group.
0.1 per cent of all admissions to the institution were diagnosed Psychosis with Infectious Disease as compared to 2 per cent in the juvenile group.
0.4 per cent of all cases were diagnosed as Psychosis with Organic Brain Disease as compared to 0.8 per cent in the juvenile group.
29.7 per cent of all admissions were cases of various other varieties of psychoses (mainly Senile Psychosis, Psychosis with Cerebral Arteriosclerosis and Involutional Melancholia) as compared to only 2.4 per cent in the juvenile group with cases of cerebral neoplasm and endocrine dyscrasia represented.
3.5 per cent of all admissions were diagnosed as Not Psychotic as compared to 2 per cent in the juvenile group.
3.5 per cent of the total of admissions to this institution were undiagnosed compared to 0.8 per cent in the juvenile group.

Of the 273 juvenile patients admitted to the hospital since 1891, there are 56 who have received considerable in the way of shock and other special therapies—prolonged narcosis, convulsive shock with picrotoxin, metrazol and electricity, insulin therapy and narcosynthesis, and with but three exceptions these 56 "newer therapy" juvenile cases were chosen from those juveniles received at the hospital since 1936 of which there have been 127 in all. In this treated group were 38 schizophrenic reaction types, 8 affective reaction types and 5 cases diagnosed psychosis with mental deficiency. There were 4 major behavior problems diagnosed psychosis with psychopathic personality and one case of undiagnosed psychosis, now considered probably to have been a case of mood disorder. Only 6 of these 56 treated juveniles responded favorably, with 4 in the schizophrenic group, 1 affective reaction type and 1 case of undiagnosed psychosis achieving full social recovery. The majority of the schizophrenic patients showed poor results with shock and other treatments as did the entire group of patients diagnosed as suffering from psychosis with mental deficiency and the entire group diagnosed as cases of psychosis with psychopathic personality. The majority of patients in the affective reaction type group likewise made no favorable response of sufficient permanency to permit returning home.

These results are in sharp contrast to those obtained in the total population at this institution, now exceeding 2,100 and therefore

very preponderantly an adult population. During recent years, in this latter group approximately 47 per cent of all patients selected for shock treatment responded favorably to such therapy, while for the juvenile group it is evident that in but 10.7 per cent of cases were the results correspondingly favorable. The comparatively unfavorable response to shock treatment in the juvenile group is in itself perhaps indicative of a more malignant type of disease occurring in the younger patients.

The unfavorable prognosis for juveniles in the state hospital seems further attested by the post-release data obtained in this study. For the entire juvenile group only 18 per cent of those released from the hospital have continued well mentally for any extended period, while the majority of patients, or 82 per cent, were before long returned to this or other institutions. If these releases are broken down into the various diagnostic groupings, it is found that there have been 61 schizophrenic patients released, only 13 of whom have continued mentally well enough to adjust themselves socially, while 48, or 80 per cent, have been either returned to this, or admitted at other institutions. In the manic depressive group the finding is almost identical. Only 9 of the 47 released patients so classified have not been subsequently reinstitutionalized and are considered social recoveries, while 38, or 80 per cent, of the 47 patients have been rehospitalized here or elsewhere. Of the paroled or discharged patients in the group psychosis with psychopathic personality, only 6 of the 24 released patients have made satisfactory social adjustments, while 18, or 75 per cent, have been reinstitutionalized. In the group of patients diagnosed psychosis due to convulsive disorder, there have been 2 permanent releases, while 14 have been returned to hospitals, an 87½ per cent recurrence. Of the 13 releases in the group psychosis with syphilis of the central nervous system, 3 have been able to adjust, while 10, or 75 per cent, have been returned to this or other institutions. This again contrasts significantly with the total group of patients in the general resident census who have been either paroled or discharged from the hospital. Approximately two-thirds, or 65 per cent, of those released have been able to make satisfactory social readjustments and return to this or other institutions has not proven necessary.

Discussion

The malignant tendency of adolescent or pubertal insanity has long been recognized. The early, now classical, reports of Morel, Hecker, Kahlbaum and Kraepelin bear ample evidence. That the extremely poor outlook for juvenile patients admitted at Eastern State Hospital during the 57 past years is in part, at least, attributable to the essentially malignant character of adolescent illness can scarcely be disputed. Impossible, however, to properly appraise is the added and certainly deleterious effect of enforced and protracted unhealthy association with large numbers of mentally seriously deranged adults. It would seem that the opportunity for healthful, emotional development and the attainment of maturity would have scarcely been open in such an environment even to the otherwise normal adolescent. In these present rosy days of the shock treatment era in state hospital psychiatry, there is perhaps all too often a tendency toward the idea that when shock treatment has been administered and a negligible quantity of individual attention or psychotherapy rendered, that "everything possible has been done." Certainly shock therapy has proven a boon in state hospital psychiatry. It has provided impetus to therapy and proven a weapon to be administered hopefully and rather generally. Before Sakel and Meduna it was all too easy to obtain surcease in the doldrums of the hereditary insanity concept. We feel that now many are seeking that same surcease in the "patient received shock treatments: everything possible is being done" platitude.

On the basis of this present study, there seems ample evidence for the conclusion that the juvenile patient did poorly in the older state hospital with its purely custodial approach and presently pursues an equally discouraging course in a state hospital environment where, though newer therapies are administered abundantly, the total push program is not specifically and directly geared toward the fulfillment of the emotional and personality needs of normal adolescence.

The following case history is that of a patient still in residence at Eastern State Hospital, admitted September 9, 1905 at the age

of 15 years, and still maintained at the expense of the commonwealth. At current per capita daily cost in Washington state mental institutions of approximately $2.00, the cost to the state of maintaining this patient thus far is in excess of $30,000. This patient is 58 years of age, in excellent physical health and certainly with at least average life expectancy.

C. J. was committed to Eastern State Hospital at the age of 15 years in 1905, because of increasing apathy of three months duration, together with deepening preoccupation and periodic irritability.

Personal History: Apparently no data in the personal history was thought relevant to the patient's illness inasmuch as the original record is sketchy in that regard. Birth and early development were said to have been normal and the usual childhood diseases were experienced without complication.

Family History: The patient's mother was said to have been of nervous disposition, on occasion unreasonable and irritable.

Mental Examination: The patient was described as having been resistive and uncooperative when brought into the hospital. Combative and destructive tendencies were mentioned. Speech was described as slow and hesitating with a tendency to answer questions in monosyllables. Replies to questions, however, were relevant and coherent. In the emotional field apathy was outstanding with only a superficial interest in environment manifest. The patient was described by the ward physician as preferring to be by himself and evidencing no interest in participating in ward activities. The occurrence of auditory hallucinations during the patient's first few weeks in the hospital was apparently not definitely established. Mention was made of bizarre mannerisms and silly attitudes. It was reported that the patient's memory seemed good, that he recalled correctly the circumstances of his coming here to the hospital, together with incidents in his early life.

Physical Examination: No formal physical examination is recorded in the early history of this patient. Mention is made in the record, however, that "he appears to be in good health."

Diagnosis: The psychiatric diagnosis assigned was dementia praecox.

Course in the Hospital: When first admitted to the hospital this patient was described as uncooperative and on occasion physically resistive. Apparently there was considerable fluctuation from day to day in his ward adjustment with alternating periods of confusion and irrational speech followed by other periods of quiet, fairly normal behavior during which he was approached and able to discuss personal problems with some degree of insight. The initial ten or fifteen years of this patient's hospital life were marked by numerous incidents of disturbed behavior, escapes, simulated epileptiform seizures described as hysterical and occasional episodes when catatonic symptomatology was prominent and tube feeding required. In the years that followed, and as he grew older this patient has gradually become more adjusted to the routine, i.e., he has become "institutionalized" although gradually deteriorating mentally. At the present time he has freedom of the grounds, keeps entirely to himself, speaks only when addressed responding entirely in monosyllables. The presence of poorly organized, fantastic delusions is vaguely admitted and the occurrence of hallucinatory phenomena involving the auditory and visual fields is very obvious. Bizarre facial grimacing is observed; many routine activities are performed ritualistically. His present status is one of self-absorption with complete acceptance of the superficialities of institutional routine but yet a complete personal detachment from the realities of institutional life. It is no longer possible to stimulate the interest of this patient in anything about him or in his future. He has no desire to leave the hospital. Occasionally in his more talkative moods he expresses complacency in remaining here stating that he "belongs here because of hereditary insanity."

Comment

This case summary presents a patient who has been at this institution for 43 years, entering the hospital as a juvenile at the age of 15 years. Deterioration occurred with comparative rapidity during his first decade of hospitalization and in general his mental status has remained essentially stationary during the last three decades. This patient, admitted long ago in the preshock era, has received nothing more than the minimum of treatment and custodial care.

Of juvenile patients admitted to Eastern State Hospital during the current shock era —the golden age of erstwhile asylums, the following case condensation is, unfortunately, representative.

J. R. was admitted to Eastern State Hospital at the age of 14 years in 1939, because of his parents inability to control him. Immediately prior to admission it is reported that he had become increasingly disobedient, had thrown some valuable sheet music into the river, had hidden his father's carpenter tools and in general his behavior in public had become such as to be seriously embarrassing to his parents.

Family History: The family history revealed only that a maternal great-aunt had become psychotic very shortly before her death at an advanced age. The patient's mother was referred

to as nervous and the father as strong-willed and obstinate.

Personal History: Birth and Early Development: The patient was a planned-for-baby, the first of three siblings, weighed 10½ pounds at birth and delivery was said to have been difficult with labor of twenty-four hours duration. Early development was normal except for delay in bowel and bladder control concerning which latter situation the parents reportedly became increasingly tense, and wrangled much over the proper method of treatment and handling.

Education: This youngster began school at the usual age and progressed normally in his studies. He was a disciplinary problem in school, seemed deliberately to misbehave for its attention-getting value and made only average grades. He was considered by the teachers as a student possessing "the intelligence to lead the class if he would but apply himself."

Personality: The patient's personality was said to have been characterized by lack of sociability attributed by the parents to inability to make friends rather than a desire to be alone. He is said to have never responded to demonstrations of affection by others tending to be undependable, personally slovenly and rather heartily disliked by his schoolmates, many of whom considered him as definitely queer.

Previous Psychiatric History: It is of interest that this youth had been examined at a very reputable child guidance clinic in another state just two years previously where the presenting problem was "excessive day-dreaming at school and poor quality of school work in spite of his superior intelligence." After examination and study the clinic reported that "the parents are more in need of treatment than the patient. The child's knowledge of sex should be discussed with them because his emphasis on vulgar stories may indicate little information about anatomy or sex." Apparently, however, there was little other than the initial examinations undertaken at the clinic and no attempt to follow through with a program of actual therapy.

Mental Examination on Admission: This patient had serious difficulty in adjusting to the ward routine and tends toward aloofness. It is difficult to excite his interest in interviews and his effort is poor. His expressions verge on incoherency and many questions are answered in an irrelevant fashion with evasion, generalities and some pseudoprofundity. Many of his remarks contain an element of self-depreciation and he speaks of having wasted time, of being unworthy, etc. Somatic preoccupation is suggested. He speaks of his hands looking peculiar and on several occasions remarks that "I guess Pa must have played with them when I was a baby.' His sensorium is fairly intact. A Binet-Simon test gives his mental age as 16 years, 2 months.

Admission Physical Examination: Adolescent youth in good physical condition. Moderate cervical adenopathy. Irregular crowded upper incisors. Laboratory: Blood, urine and spinal fluid examinations are normal.

Diagnosis on Admission: The presence of a process tending toward disorganization was apparent to all in this case, and yet, the value of an appellation with less malignant connotations to insure "keeping open the door to therapy" was recognized. On this basis a provisional classification of primary behavior disorder, recessive type was assigned, later revised to schizophrenia, hebephrenic type.

Course in Hospital: This patient has presented a serious challenge to the hospital routine throughout his entire stay. Defiance, detachment and egocentricity were, during the first two or three years, at all times outstanding with complete inability to appreciate the rights of older fellow patients, a tendency to tease older men and complete inability to make friends or associate with others on any basis of emotional attachment. Many times in our experience, children on the wards with adult patients are to some extent taken over by some adult becoming interested in the child's welfare endeavoring to protect and mother him and shield him from the rough talk and unpleasant sights and experiences of ward life. No such attachment, however, occurred with this patient. A course of insulin therapy was undertaken without improvement and later convulsive shock therapy with metrazol was tried. Electroshock was also utilized as well as sporadic experimentation with narcosis. During the past 3 years almost complete deterioration has developed so that the patient now is mute, untidy and without any evidence of the slightest degree of active interest in his environment. There continues, however, to be evidence of passive awareness of environmental surroundings.

Comment

This case condensation presents a patient admitted to the hospital as a juvenile at the age of 14 years and whose hospital residence is of 9 years duration. It is of particular interest that he was admitted during the very early phase of a mental disorder which has run a violently malignant course eventuating in complete deterioration in a very few years. A review of the record discloses considerable evidence of the patient's failure from the outset to achieve satisfying personal relationship in a group composed preponderantly of adults. While one can do no more than speculate as to the possible course of events had this mere child whose basic intelligence approached the catagory of genius received care and treatment in a special childrens' unit, we nevertheless are of the

opinion that at least in some more favorable environmental situation the rate of progress of the deteriorating process could have been slowed appreciably and probably halted.

Much attention has been directed to the need for the creation of special childrens' units at those institutions receiving patients under 16 years of age and the standards to be met in such units have already been publicised. Although the cost of establishing and maintaining such special units at the suggested level of excellence is considerable, so too is the cost of maintaining for a lifetime of custody in present state hospitals those individuals who, through no fault of their own, find themselves before age 18 years admitted to state institutions improperly and inadequately equipped to meet the needs of ailing adolescent personality.

Without regard to the social and ethical considerations and obligations involved, the potential cost to the state represented by the individual requiring care for mental illness before 18 years of age bears repeated emphasis to legislators empowered in the allocation of public funds and those charged with responsibility of planning the fulfillment of community needs.

This study indicates that at least as concerns Eastern State Hospital, the individual admitted before 18 years of age has but one chance in ten to avoid a lifetime of hospital residence which under current cost, steadily mounting, represents a potential direct liability to the commonwealth of many thousands of dollars, disregarding again the social and productive loss to society of an individual isolated in an institution in the early morning of life. Certainly there would seem ample justification for the complete abandonment of parsimony when making provision for individualized therapy for the mentally ill juvenile.

Summary and Conclusions

All patients who were under 18 years of age when admitted to Eastern State Hospital, which is not equipped with special facilities for children and adolescents, were considered for this study. The histories, treatment methods, prognoses and follow-ups have been carefully analyzed and evaluated and compared with the corresponding findings of the adult population of the institution.

The well recognized malignant character of mental illness developing in the juvenile is confirmed.

Although recovery and release rates in the total population at Eastern State Hospital have increased very significantly attributable to increasing utilization of the newer therapy of the past decade, recovery and release rates in the juvenile group have not kept pace correspondingly.

It is suggested that though the poorer prognosis for the hospitalized juvenile is linked with the increased severity of mental illness developing in the early age epoch, lack of specialized pediatric and orthopsychiatric attention and the deleterious effect of environment is also a contributing factor.

Disregarding human values entirely, the venture of high expenditure in providing a proper treatment program and environment for the juvenile is economically sound, if even but slight increase in release rate is obtained thereby, as each juvenile admitted to a state hospital represents a potential financial liability mounting into thousands of dollars—the mere dollars and cents cost to the state of a lifetime in custody.

The plight of the juvenile in the state hospital is extreme and to paraphrase the Hippocratian aphorism — extreme remedies are appropriate. This must be the concern of state legislators having under consideration the allocation of public money to the development and proper staffing of special childrens' units supplementary to present state hospital organizations.

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*Psychosomatic Reactions to the Induction of Hypnosis**

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Psychosomatic reactions to the induction of hypnosis occur frequently. Usually they are relatively mild, often remain unobserved by the hypnotist, and at times, especially during therapy, are mentioned eventually by patients or are readily discovered through direct questioning. The types of reactions vary with different patients. Often they involve the respiratory, cardiovascular, and gastrointestinal systems, manifesting themselves as slightly increased rate of breathing with more shallow or deepened respirations, mild tachycardia, and altered gastrointestinal motility. The reactions are somatic expressions of anxiety in relation to hypnosis as a new experience with whatever conscious or unconscious significance this might involve. The anxiety may be related to awareness on some level, conscious or unconscious, of what might emerge as a result of the experience. At times the somatic phenomena may represent hysterical conversion reactions with varying degrees of pertinence dynamically. Occasionally such reactions are quite marked and assume dramatic proportions. There are described below the reactions of two patients. The accounts rendered briefly and essentially descriptively are of interest because of the intensity of the reactions. Further remarks regarding theoretical complications will follow.

Cases

Case I: This 42 year old patient was evaluated psychiatrically at the Audiology Clinic, New York Regional Office, Veterans Administration, following complaints of marked loss of hearing with tinnitus and vertigo. Testing of hearing was difficult because of the personality disturbance, but there were various definite clinical indications that his structural hearing apparatus was intact or nearly so. He had an hysterical personality and the possible existence of a pre-psychotic state was considered. He did not cooperate sufficiently for adequate psychological testing. Hypnosis was attempted after preliminary interviews in order to evaluate its possible use in tests of hearing[1,4] for psychiatric diagnostic purposes, and for an evaluation regarding a trial at treatment.

An hypnotic induction procedure was introduced with a method of visual fixation. He was seated in a large, comfortable easy chair. Fixation on a point opposite was suggested. As induction proceded, he complained that his eyes teared and that they were growing tired. He attempted to disrupt the induction but concentration was again encouraged. As induction continued, he complained that he was not feeling well. He then held his head in his hands. His body twisted in position so that his shoulders came to rest on one arm of the chair and his legs on the other. Then his back became arched and a position of opisthotonos resulted. This was maintained for five minutes. While assuming this position his breathing increased in rate, reaching seventy respirations per minute. His face grew pale. He said nothing. He was watched carefully but without interference. After five minutes had passed, respirations decreased toward the normal range, his color improved, his muscles relaxed, and the postural attitude was terminated. He stood up, walked about the room for half a minute and then commented nonchalantly that he frequently experienced this type of "spell."

At the next interview the patient defended himself less dramatically against the hypnotic experience. The induction procedure was attempted again, and as preliminary instructions were verbalized he simply commented that he could not hear what was being said. (This was inconsistent with previous experience in contacts with him). As the induction continued the patient entered the hynotic state but not before he had interrupted several times. At times he coughed so forcefully that he terminated the pro-

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cedure. At least twice he disrupted the procedure by turning to the examiner with his usual comment, "I can't hear a word that you are saying." Then he interrupted again with the complaint of his eyes hurting. Soon it was evident that he was strongly resisting eye closure. Eventually, however, he entered the hypnotic state, but not before saying, "I'm falling asleep." In accordance with the planned approach he was given instructions for awakening and for the completion of a post-hypnotic act. He awoke satisfactorily, did not act upon the post-hypnotic suggestion, commented on some thoughts during the hypnosis, and then, without further instructions having been offered, he spontaneously reentered the hypnotic state. Additional instructions were then given to attempt completion of the post-hypnotic act referred to previously, but the patient did not respond to verbal suggestions for awakening. The hypnotic state might possibly have merged with a state of sleep but this was not definitely ascertained. He awoke when his knee was tapped. The suggested post-hypnotic act was not performed. He commented that he felt dizzy and protested, "You put me to sleep!"

Case II: The patient, a 39 year old veteran, was studied for a psychogenic hearing disability. Impressions had been gathered also that some conscious exaggeration of hearing loss might exist. On various occasions with different examiners he showed responses to low conversational tones. An hypnotic procedure was used with the purpose of clarifying audiometric testing records. His cooperation had been offered when the induction was attempted.

A technique of visual fixation was employed with suggestions of relaxation, drowziness and sleep. The patient persistently turned his eyes from the original point of fixation and looked at the examiner despite instructions to the contrary, finally claiming that he could hear better in this way. Because of his persistence it was finally agreed to permit this, and then it was observed that when he was requested to focus on a point on the examiner's forehead, he insisted on looking directly at his eyes. He never glanced directly at the examiner's lips. Soon he showed evidence of entering the hypnotic state, but immediately his resistance against this became very marked. He made strenuous attempts to fight off the hypnosis. He began to grow uneasy as feelings of drowziness began to come over him. He squirmed uncomfortably in his chair. His eyes closed repeatedly and he struggled to reopen them. Unable to achieve this readily, he lifted his right hand and literally pried them open, but even this type of voluntary muscular effort could not succeed and he relinquished the attempts. His breathing became very loud and heavy. Expirations were forceful and voluminous. His eyes having closed, he rubbed his face roughly with his hands. Then he coughed repeatedly, loudly, and forecfully. Squirming continued and soon he opened his jacket and some buttons on his shirt as if to gain release in this way. He buried his head in his hands, leaning first to one side of the chair and then to the other. Struggles to effect eye opening continued unsuccessfully. He moved again from right to left and back. Then he struggled forward in his chair and half draped himself over the desk before him, reaching out blindly and gropingly. His face had become markedly flushed. He appeared to be trying to grasp any objects available and finally contacted some folders on the desk and then a heavy, glass ashtray which he fingered repeatedly. Finally he began to retch as if he were going to vomit but the latter did not occur. In view of the intense resistance, continuation of the struggle appeared unwarranted. Adequate future contact with this patient to deal with the anxiety generated at this time appeared unlikely, so it was decided to induce a complete post-hypnotic amnesia. This was accomplished successfully. After the hypnotic state had been terminated, the patient remarked that he felt tired and that it was strange in view of the fact that he had had about twelve hours of sleep the night before. Some additional contact on subsequent days with the examiner and other staff members revealed no apparent ill effects.

Discussion

The discernible psychosomatic reactions in the first patient involved essentially the cardiovascular and respiratory systems. In connection with the type of coughing exhibited here and with the second patient too,

it may be stated as a point of interest that the writer has encountered this not infrequently among patients with psychogenic hearing disabilities during the process of hypnotic induction. Tentative impressions had been gathered in a series of cases that this might be related to certain unconscious homosexual fantasies which in turn might be connected with some aspects of the personalities of patients developing psychogenic hearing problems. The homosexual implications would have meaning in relation to the transference relationship in the hypnotic experience. Some aspects of the latter have been discussed elsewhere.[2]

The cardiovascular reaction and respiratory alteration appear to be non-specific somatic correlates of anxiety experienced by the patient in relation to a threatening stimulus which was potentially capable of disturbing the psychologic defenses erected in connection with unconscious conflict. The respiratory response in the form of the cough seems to move into the realm of a conversion reaction. Likewise, the nature of the over-all muscular response appears to fit the pattern of an hysterical seizure which apparently had been encountered more frequently, although not necessarily in relation to hypnosis, by psychiatrists during the last century. This seizure permitted a retreat from the hypnotic experience and its dramatic aspects were consistent with the highly emotional and generally overly dramatized behavior of this patient.

In the second patient, the cardiovascular and respiratory responses are again in evidence. In addition, however, there is a muscular response as widespread as with the previous patient, but apparently more of a psychosomatic phenomenon than a hysterical reaction. Also, organs of sensation come into greater prominance. And finally, the gastrointestinal system is included. The pattern of response differed somewhat too in that the total withdrawal evident in the first hypnosis session with the previous patient may be contrasted with what seemed to be more of a step by step retreat in the second, with the utilization of new defenses giving the impression almost of successive stages of regression. The latter were movements from the skeleto-muscular response to the respiratory and finally to the gastrointestinal. Somewhere in between, the cardiovascular reaction occurred. Also, the separation between reactions of the various systems was not clear-cut; overlapping occurred. The organ of vision was utilized early in the patient's response. Tactile functions were employed later while muscular phenomena were much in evidence.

The reaction of the first patient was clearly one of flight. The major defense permitted this flight. There seemed to be little attempt to reject aggressively the disturbing stimulus. The cough reaction is probably the closest to what may be interpreted as an effort to reject the intruding agent.

The second patient tried to defend himself with the use of the organ of vision. Here, its receptive function was replaced in part with an almost magical conception of its effectiveness as a weapon. It could stave off attack because seeing woud be controlling. However, it proved to be ineffective. Then the muscular system was brought into play, at first to lend support to the organ of vision and then in its own right. But it too proved ineffective because its force was striking out against an unseen enemy. The cough with this patient served the same function as for the first, but the remainder of the respiratory response gave a different impression in that the expiratory phase, in its forcefulness, appeared to have the more specific connotation of an attack, as defense, with attempted extrusion of the noxious stimulus. The retching, as the gastrointestinal phase, again appeared to be an effort to extrude this agent, and aside from the cardiovascular reaction it seems to be one of the most regressive devices that came into play. The tactile response in the searching out and handling of obtainable objects gave the impression clearly of the attempt to maintain some hold on external reality in order to avoid submission to this vague, threatening force.

All of the components in this clinical picture within a psychiatric setting serve to indicate that the marked reactions exhibited by the patients stemmed from the threat of exposure of unconscious conflict by this highly charged, yet vague and ill defined stimulus.

Lastly, but of notable importance, is the technique of hypnotic induction. Actually, the word hypnosis, was never employed, and

the procedure was partially described and discussed in keeping with the immediate purposes of the interviews as they related to diagnostic and therapeutic considerations. This modified approach has been outlined in another paper.[3] At no time during the period of contact between the examiner and these patients was there any awareness revealed by them that "hypnosis" had been employed, nor was any such awareness revealed to other staff members. The reactions, therefore, cannot be related to any response to hypnosis on the basis of preconceived ideas, possibly incorporating commonplace misconceptions regarding this procedure as an undesirable and somewhat magical operation. The hypnotic relationship apparently constituted, aside from the physiological components of the induction technique, a vague, ill-defined, and intensely threatening, noxious agent which was potentially capable of overwhelming these patients, permitting thereby the uprooting of defenses erected against exposure of unconscious conflict. The intensity of the conflict was probably matched by the intensity of these reactions, and the nature of the reactions was apparently consistent with what was known about the personalities of the respective patients. To a lesser degree and usually less dramatically, psychosomatic phenomena are almost universally encountered as reactions to equally veiled and threatening psychologic stimuli in the form of certain interpersonal relationships outside an hypnotic setting.

Summary

Psychosomatic reactions to the induction of hypnosis are presented. They include muscular, cardiovascular, gastrointestinal and respiratory responses. Visual and tactile functions are involved in one case. The reactions constitute somatic expressions of anxiety associated with the hypnotic experience, or defenses against it. The hypnotic experience apparently constituted a vague, ill-defined and intensely threatening, noxious agent which was potentially capable of overwhelming these patients, permitting thereby the uprooting of defenses erected against the exposure of unconscious conflict. There are broader implications in that psychosomatic phenomena are almost universally encountered as reactions to equally veiled and threatening psychologic stimuli in the form of certain interpersonal relationships outside an hypnotic setting.

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Neurological Clinical Pathological Conference

OF THE CINCINNATI GENERAL HOSPITAL

CHARLES D. ARING, M.D., Editor

CASE NO. 486609 (JH)

Presentation

A 56-year-old housewife was admitted to the hospital on July 26, 1948 complaining of dizziness, nausea and vomiting that had lasted for 2 weeks. She had been mildly diabetic for approximately 6 weeks, having been controlled by diet alone. She had a number of teeth extracted in April. The patient had enjoyed good health until early in July when, rather suddenly, she developed dizziness, nausea, vomiting and frontal headache, all persisting unremittingly until admission to the hospital. She had undergone a radical left mastectomy 8 years previously; otherwise her past history revealed that she had been well.

At the time of admission to the hospital, the neurological abnormalities were the following: violent horizontal nystagmus on lateral gaze and vertical nystagmus on fixation of eyes in any other direction, and diminished deep reflexes in the legs. There was the evidence of the old left mastectomy.

In the hospital the patient vomited after many of her meals, and she complained of vertigo except when reclining. After a week of drug therapy consisting of sedatives, belladonna, anti-histamines and potassium chloride, she improved, although the symptoms did not disappear entirely.

On August 12 she was discharged to her home. She had been taken off of medicine on August 22 with temporary improvement, later she complained of dizziness and staggering and fell on several occasions. Because of the persistence of symptoms she was readmitted on September 25. Examination at the time of re-entry to the hospital revealed the nystagmus previously described. In addition the left pupil was 5½ mm. and the right 4 mm. Hearing was grossly normal. The deep reflexes were normal.

On September 29 the pupils were found to be equal. The left palpebral fissure was narrower than the right. It then became apparent that she had spotty memory defects and limited attention span. She became increasingly confused, emotionally labile, drowsy and lethargic. By October 6 the lower portion of the left side of the face moved more quickly and to a greater degree than the right; she had slurred speech, mispronounced words, and had mild ataxia of all limbs most obvious in the lowers with a tendency to fall to the left. Nystagmus increased in amplitude until it became wildly swinging. During the ensuing 2 days difficulty in swallowing and weakness of palatal movements appeared. Gag reflex disappeared, and the deep reflexes could not be obtained. She rapidly became incoherent, generally weak, incontinent, stuporous and finally comatose. On October 9 a craniotomy was performed following immediately on ventriculography.

The temperature was normal throughout the hospital course; the pulse rate ranged around 100 and the respiration 22. Blood pressure varied between 140/80 and 155/85.

The blood counts, urea nitrogen, total and fractional proteins, and serological reactions were normal. Frequent blood sugar determinations varied between 115 and 184 mg. per cent. Stool examinations were normal as were urinalyses except for an occasional sugar reaction and traces of acetone.

Roentgen examination of the chest, skull, abdomen, gall bladder and upper and lower gastroenteric tracts failed to reveal abnormality. On October 9 ventriculographic examination revealed symetrical dilatation of the lateral and third ventricles. Cerebrospinal fluid examinations on 2 occasions (August 3 and September 27) were entirely normal with the single exception that the pressure was 180 mm. of water on the first tap. The color, cell count, dynamics, proteins (39 and 42 mg. per cent), chlorides, sugar, colloidal gold curve and serological reactions were normal.

Differential Diagnosis

Dr. Howard D. McIntyre: To dispose of unlikely possibilities first, the sudden onset and history of diabetes suggests that mild angiospasm in the brain stem might explain the symptoms on a vascular basis. The fact that some teeth had been removed suggests a possible focus for embolus or abscess, although this would be a most unusual happening; whenever I have made such a diagnosis I always have been wrong.

The sudden onset in July 1948 of dizziness, nausea, vomiting and headache, would seem to favor vascular disease. Removal of a breast eight years previously brings up the possibility of metastatic carcinoma; however, 8 years is an unusually long interval between removal of the primary lesion and the signs of metastasis in the brain. I have seen the sequence with prolonged intervals with hypernephroma of the kidney.

The neurological findings on admission suggest a cerebellar localization. The hospital course with vertigo and vomiting, and the treatment with potassium chloride and antihistaminics indicate that someone believed the patient had either Meniere's disease or a labyrinthitis. In neither of these diseases do the signs persist as they did in our patient. In Meniere's disease, nystagmus is present in the attack but not during remission. That this patient was discharged on August 12 and considered to be improved is evidence that her physician did not think she had a tumor but was probably misled into a diagnosis of labyrinthine disorder.

The return of her original symptoms plus ataxia again brings up the possibility of tumor as a cause of the symptoms. Perhaps with remission of symptoms multiple sclerosis might have been considered. The findings on return to the hospital on September 25 suggest a diagnosis of cerebellar disease, although it is interesting to note that at this time the deep reflexes were no longer hypoactive. The fact that the hearing was normal would tend to exclude eighth nerve tumor as a cause of the symptoms.

The neurological examination of September 29 added the symptoms of confusion, memory defect and lethargy, indicating progress of the pathological condition. Mental symptoms are not usual in cerebellar tumor and suggest acute internal hydrocephalus.

On October 6 the symptoms were certainly cerebellar, particularly the slurred speech, dysarthria, nystagmus, ataxia and falling to one side. It was noted that the nystagmus had increased at this time. The progressive symptoms point to tumor as the most logical explanation. Other symptoms of progression were weakness of the palate, absence of gag reflex and loss of deep reflexes. These symptoms may be interpreted as those of brain stem disorganization. Acute internal hydrocephalus is suggested by the rapidly changing awareness and the final coma.

The craniotomy done on October 9 after air studies, was possibly for posterior fossa exploration; the dilatation of lateral and third ventricles would ordinarily point to an infratentorial lesion. An omission in this case was that no value for ventricular proteins is noted; the proteins should be increased in the ventricular fluid.

My diagnosis is cerebellar tumor. I cannot indicate the type but primary tumors of the cerebellum are extremely rare at the age of 56 years.

Pathological Discussion

Dr. Daniel Osher: Ventriculogram was done prior to surgery and revealed symmetrical dilatation of the lateral ventricles. The patient ceased breathing while the x-rays were being taken but her respirations resumed after the ventricle was tapped and the pressure relieved. A sub-occipital craniectomy was done. The first abnormality noted was the marked thinning of the occipital squama especially on the right. The dura was opened and the left cerebellar hemisphere appeared normal. On needling this hemisphere nothing remarkable was encountered. The cerebellar tonsils were herniated down to about the level of the first cervical vertebra.

At about 1½ cm. below the surface of the right cerebellar hemisphere, a large cyst was encountered; it was filled with a watery, whitish, fluid resembling colostrum. The cyst measured about 6 cm. in diameter. Its lining was smooth and glistening and seemed to be made up of compressed cerebellar white matter. Along the lateral aspect of the cyst the lining had a slightly pink, slightly granular appearance and appeared to represent a mural nodule. The lateral third of the cere-

bellar hemisphere was then removed down to and including the lateral part of the cyst wall with the abnormal tissue.

The posterior fossa of the skull on the right side seemed to be much larger than normal in its transverse diameter. At operation the cystic appearance of the mass, the thinning of the bone and the increase in size of the posterior fossa all suggested grossly a diagnosis of benign tumor such as an astrocytoma.

Dr. Philip Wasserman: The specimen when received at the laboratory consisted of numerous fragments of tissue obtained by surgical intervention. Grossly it was difficult to identify the abnormality since the tissue was found to be of pinkish white and yellowish structure without any recognizable detail. However, microscopic examination revealed, in addition to recognizable brain tissue, the presence of numerous gland-like formations with the cells suggesting an epithelial origin. While there was invasion to be seen in places, there were other areas where a relatively sharp line of demarkation between tumor and the regional brain parenchyma was found. Such findings suggested that we were dealing with a metastasis, and when one took into account the character of the tumor with its epithelial-like appearance and its gland-like or tubular-like structure, the impression of a metastatic tumor was difficult to escape.

A comparison with the tumor in the breast, which had been removed some 8 years ago, revealed sufficient similarity of histological detail to strongly suggest that the tumor found in the brain must be looked upon as a metastasis from the tumor that had been removed years before from the breast.

Clinical Diagnosis

Cerebellar tumor.

Dr. McIntyre's Diagnosis

Cerebellar tumor.

Pathological Diagnosis

Metastatic tumor of right cerebellar hemisphere from carcinoma of the left breast, left mastectomy—eight years previously.

Dr. Osher: Probably the tumor had been there for many years; perhaps proof of this is the boney change.

Dr. Charles D. Aring: Should we not have picked up the thinning of the occipital bone in the roentgen plates?

Dr. Osher: No. It is not visable in our roentgenograms. It is conceivable that the views taken from the proper angle would have demonstrated it.

Student: Was there any recurrence of carcinoma at the operative site in the left thorax?

Dr. Osher: None. The patient now (December 1, 1949) appears well and is doing much of her housework. The only sign that I can find now is a slight stagger on rounding corners. As to the advisability of operating for cerebral metastases, according to the records about 50 per cent of the cases are single.

Dr. Frank Espey: Couldn't a high degree of myopia have obscured the papilledema?

Dr. Osher: She had no papilledema and she had no myopia.

Dr. Aring: The best explanation of why people do and don't develop papilledema with increased intracranial pressure is that of Lauber.* He noted that increased diastolic venous pressure in the retina and its relationship to diastolic arterial pressure in retina are decisive in the formation of papilledema. With an imbalance of this pressure relationship toward the venous side choking is favored, the reverse pertains with the balance on the side of the arterial pressure.

*Lauber, H.: "The Formation of Papilledema," *Arch. Ophth.*, 13:733-743, 1935.

THE EBAUGH FOUNDATION

Of wide interest and satisfaction to his friends and associates throughout the country is the formal recognition of the work of FRANKLIN G. EBAUGH of Denver.

February 16, 1950, was the twenty-fifth anniversary of Dr. Ebaugh's opening of the Colorado Psychopathic Hospital. On that date a testimonial dinner was tendered him by the University of Colorado Medical School and the funds for the Ebaugh Foundation were presented to the University. This dinner was the occasion for according to Dr. Ebaugh the honors long due him for his outstanding achievements and his preeminent work in the advancement of neuropsychiatry.

Dr. Ebaugh's activities have been numerous and valuable and have been national in scope. After his graduation from Johns Hopkins Medical School, Dr. Ebaugh served successively on the staffs of Phipps Psychiatric Clinic, New Jersey State Hospital and State Reformatory, Philadelphia General Hospital, University of Pennsylvania and Womans Medical College before he came to Denver in 1924 where he became Director of the Colorado Psychopathic Hospital and Professor of Psychiatry, University of Colorado School of Medicine. From 1942 to 1946 he went on leave to serve as Neuropsychiatric Consultant for the Eighth Service Command, September 1942 to June 1945. He acted as neuropsychiatric consultant to the Armed Forces of the Pacific from June 1945 to November 1945 and was awarded the Legion of Merit. He acted as Director (part time) of the Division of Psychiatric Education, National Committee for Mental Hygiene, from 1933 to 1942.

His participation in medical society activities has been wide spread and he has held membership and high office in these societies. He has been president of the Colorado Neurological Society, the Central Neuropsychiatric Association, Colorado Society for Mental Hygiene, and the American Association for Research in Nervous and Mental Disorders. He acted as chairman of the sub-committee and member of the Committee on Neuropsychiatry, National Research Council; consultant on mental health, U. S. Public Health Service; neuropsychiatric consultant, Veterans Administration, Branch 13; neuropsychiatric consultant, Surgeon General's Office. He has been a contributing editor to the *American Journal of Medical Sciences. American Practitioner, Post-Graduate Medicine,* and *Diseases of the Nervous System* and served on the editorial board of the *American Journal of Psychiatry.* He also was on the Advisory Board, Medical Specialties from 1934 to 1942.

Dr. Ebaugh's introduction of psychiatric teaching in undergraduate classes at the University of Colorado Medical School, his establishment of a psychiatric service in the Colorado General Hospital, and inaugerating of the program of graduate training in psychiatry at the University of Colorado developing into three training divisions: Colorado Psychopathic Hospital, the Psychosomatic Medicine Division of Colorado General Hospital, and the Mental Hygiene Clinic of the Colorado Psychopathic Hospital, have all been high points in his career. Dr. Ebaugh's recognition of the necessities of providing psychiatric help to the rural areas has resulted in the development of community clinics and travelling clinics. His survey of psychiatric education in 1932 under the Commonwealth Fund was published in book form and is one of the standard works in this field and aided in the development of graduate training in psychiatry in many parts of the country and encouraged recognition of the fact that the formation of an American Board of Neurology and Psychiatry was indicated. Dr. Ebaugh's efforts were instrumental in forming the American Board of Neurology and Psychiatry of which he is a charter member. He has inculcated into his students the zeal for teaching psychiatry, and it is perhaps this zeal and enthusiasm radiating from him to others that may be considered one of the greatest factors in Dr. Ebaugh's career.

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